CLAIMS

We claim:

[c1] 1. A high gain, broadband, directive, active antenna comprising:

a substantially linear, balanced, high-impedance, differential voltage amplifier subassembly utilizing passive lossless feedback for gain scalability, high linearity, and elevated input impedance;

a pair of dipole probe elements subassembly connected to the amplifier for producing an electric field sensing transduction mechanism; and

a tuned scatter-plate subassembly.

[c2] 2. The active antenna of claim 1, wherein the lossless feedback circuit comprises a wire-wound transformer connected to a Field Effect Transistor (FET) or a high impedance transistor, and wherein the voltage amplifier gain is scaled by the transformer turn-ratio.

[c3] 3. The active antenna of claim 1, wherein, a bias decoupling inductor is used to reduce noise contribution of the amplifier to the antenna across VHF, UHF, or both bands.

[c4] 4. The active antenna of claim 3, wherein the inductance value of the decoupling inductor is such that an RF voltage peaking effect is obtained at a transistor input at a desired frequency.

[c5] 5. The active antenna of claim 1, wherein the scatter-plate subassembly is tuned such that separate directive modes occur at desired areas of the RF frequency spectrum by distancing of the scatter-plate from driven elements, controlling effective inductance of the scatter-plate, or a combination of

both, and wherein the scatter-plate effective inductance is affected by material properties and geometry.

[c6] 6. The active antenna of claim 1, wherein directivity is achieved by combining multiple subassemblies into fixed or steerable arrays; by combining a driven subassembly with a non-driven director element; or by combining a driven subassembly with any number of non-driven director elements and a scatter-plate/reflector assembly, or by a combination thereof.

[c7] 7. The active antenna of claim 1, wherein for broadband TV reception, the scatter-plate dimensions and proximity to antenna amplifier and probe elements are chosen such that the antenna exhibits a minimum front to back directive ratio (F/B) of about +8dB at High VHF and UHF frequencies and to achieve similar directive properties at lower frequencies if the scatter-plate geometry is tuned appropriately for such frequencies..

[c8] 8. The active antenna of claim 1, wherein towards lower half of a bandwidth of interest, the antenna operates in a directive, capacitively-coupled loop mode in which fringing electric fields at ends of the antenna probe elements capacitively couple to the scatter-plate and create a directive loop effect and towards upper half of the bandwidth of interest the antenna operates in a reflector mode, and wherein the scatter-plate is tuned such that these separate directive modes occur at convenient areas of the RF frequency spectrum.

[c9] 9. A broadband directive antenna system comprising:

at least a substantially linear, balanced, high-impedance, differential voltage amplifier subassembly with passive lossless feedback;

at least a dipole probe subassembly connected to the amplifier for producing an electric field sensing transduction mechanism; and

at least a tuned scatter-plate subassembly.

[c10] 10. The system of claim 9, wherein:

the lossless feedback comprises a wire-wound transformer connected to a high impedance transistor;

the voltage amplifier gain is scaled by the transformer turn-ratio;

a bias decoupling inductor is used to reduce noise contribution of the amplifier to the antenna; and

the inductance value of the decoupling inductor is such that an RF voltage peaking effect is obtained at a transistor input at a desired frequency.

[c11] 11. The system of claim 9, wherein the scatter-plate subassembly is tuned by distancing of the scatter-plate from driven elements, controlling effective inductance of the scatter-plate, or a combination of both, and wherein the scatter-plate effective inductance is affected by material properties and geometry.

[c12] 12. The system of claim 9, wherein directivity is achieved by combining multiple subassemblies into fixed or steerable arrays; by combining a driven subassembly with a non-driven director element; or by combining a driven subassembly with any number of non-driven director elements and a scatter-plate/reflector assembly, or by a combination thereof.

[c13] 13. The system of claim 9, wherein towards lower half of a bandwidth of interest, the antenna operates in a directive, capacitively-coupled loop mode in which fringing electric fields at ends of the antenna probe elements capacitively couple to the scatter-plate and create a directive loop effect and towards upper half of the bandwidth of interest the antenna operates in a reflector mode, and wherein the scatter-plate is tuned such that these separate directive modes occur at convenient areas of the RF frequency spectrum.

[c14] 14. A high gain, broadband, directive, active antenna comprising:

means for amplifying signals received by probing means, wherein the amplifying means is substantially linear, balanced, and high-impedance;

means for probing radio frequency signals, wherein the probing means is connected to the amplifying means; and

means for creating directivity with separate frequency-dependant, directive modes.

[c15] 15. The active antenna of claim 14, wherein the amplifying means is a differential voltage amplifier with passive lossless feedback, wherein the lossless feedback comprises a wire-wound transformer connected to a high impedance transistor, and wherein the voltage amplifier gain is scaled by the transformer turn-ratio.

[c16] 16. The active antenna of claim 14, wherein the probing means is connected to the amplifying means to produce an electric field sensing transduction mechanism.

[c17] 17. The active antenna of claim 14, wherein, a bias decoupling inductor is used to reduce noise contribution of the amplifying means to the antenna, and wherein the inductance value of the decoupling inductor is such that an RF voltage peaking effect is obtained at a transistor input at a desired frequency.

[c18] 18. The active antenna of claim 14, wherein the means for creating directivity is tuned such that separate directive modes occur at desired areas of the RF frequency spectrum by distancing of the means for creating directivity from driven elements, controlling effective inductance of the means for creating directivity, or a combination of both, and wherein the means for creating directivity effective inductance is affected by material properties and geometry.

[c19] 19. An active antenna comprising:

a substantially linear, balanced, high-impedance, differential voltage amplifier utilizing passive lossless feedback; and

at least two dipole probe elements connected to the amplifier, wherein the combination of the amplifier and the probe elements produce an electric field sensing transduction mechanism, and wherein the active antenna operates with a bi-directive reception pattern.

[c20] 20. The active antenna of claim 19, wherein the antenna further includes a tuned scatter-plate to operate with a directive reception pattern over multiple octaves of Radio Frequency (RF) spectrum with separate frequency-dependant directive modes, and wherein the scatter-plate is tuned such that the separate directive modes occur at convenient areas of the RF frequency spectrum.

[c21] 21. The active antenna of claim 19, wherein the lossless feedback circuit comprises a wire-wound transformer connected to a Field Effect Transistor (FET) or a high impedance transistor, and wherein the voltage amplifier gain is scaled by the transformer turn-ratio.

[c22] 22. The active antenna of claim 19, wherein, a bias decoupling inductor is used to reduce noise contribution of the amplifier to the antenna, and wherein the inductance value of the decoupling inductor is such that an RF voltage peaking effect is obtained at a transistor input at a desired frequency.

[c23] 23. The active antenna of claim 20, wherein for broadband TV reception, the scatter-plate dimensions and proximity to antenna amplifier and probe elements are chosen such that the antenna exhibits a minimum front to back directive ratio (F/B) of about +8dB at High VHF and UHF frequencies and to

achieve similar directive properties at lower frequencies if the scatter-plate geometry is tuned appropriately for such frequencies.